REMARKS

Claims 23-34, 38-50 and 52-53 are pending. Claims 23 and 37 and 51 have been combined and Claims 37 and 51 cancelled. New Claims 52 and 53 recite the Mn level of 0 from the example at page 9 of the specification. New Claim 53 also recites the Fe level of Claim 50.

I. 35 USC § 103

A. Heymes et al.

Claims 23 and 26-51 stand rejected under 35 USC § 103(a) as allegedly being unpatentable over Heymes et al. (U.S. Patent No. 6,077,363). The Office Action asserts the reference expressly teaches each feature recited by the rejected claims, except for the semi-continuous casting method being DC casting. However, the Office Action continues, because "DC casting is conventional and well known," such a casting procedure is within the scope of Heymes et al.

1. The Mn-2Fe proviso of Heymes et al.

New dependent Claims 52 and 53 raise new issues because they recite the alloy has Fe (as added to base Claim 23) but is Mn-free. Heymes et al. requires the proviso that 0< Mn-2Fe <0.2. The alloys of Claims 52 and 53, where the Mn-content is 0 and Fe is present, fall outside the proviso of Heymes et al. Thus, such alloys are not allowed by Heymes et al. and Heymes et al. neither teaches nor suggests them.

Amended base Claim 23 recites the presence of Fe but at most incidental impurity levels of Mn. Thus, some level of Fe is present in the recited aluminum alloys. Typical low levels of Fe can be found in the present application disclosing 0.06%, or in Colvin (U.S. Patent No. 5,213,639), column 4, line 41 disclosing 0.07%, or US application 10/642,507 (US 2004/0099353) column 4, Table 1 disclosing about 0.06%. As a consequence in alloys where the Mn-content is in the range of incidental impurities, the Mn-2Fe proviso of Heymes et al. is very likely to be negative which is not allowed by Heymes et al.

In view of this Claim 50 further distinguishes over Heynes et al. Claim 50 recites the amount of Fe in the alloy is 0.06-0.10%.

2. Unexpected Results

The Office action asserts Applicant has not provided a clear nexus between the unexpected results and the prior art of record. Specifically, the Office action asserts Applicant has not provided evidence or arguments that 2024 or 2524 is closer prior art than the prior art of record (Heymes et al. Example A4). For example, the Advisory action states it is not clear that the ranges of Mn and Mg in example A4 would behave in the same manner as the ranges of Mn and Mg for AA2524.

Applicant resubmits the following table which compares the alloy composition information from Table 1 of the present application and the table at column 6 of Heymes et al.

Chemical composition of the alloys, in weight %, balance aluminum and inevitable impurities						
Alloy	**Cu**	**Mn**	**Mg**	**Zr**	**Si**	**Fe**
AA2024	4.4	0.59	1.51	0	0.05	0.06
AA2524	4.3	0.51	1.39	0	0.05	0.06
Present Claim 23 broad range*	3.6 - 4.9	substantially Mn free	1.0 - 1.8	≤ 0.15	0.10 - 0.40	≤ 0.10,
Invention alloy 1	4.4	0	1.68	0	0.25	0.06
Invention alloy 2	4.4	0	1.61	0	0.11	0.06
Heymes et al. broad range**	between 3.5 and 5.0	<0.55	between 1.0 and 2.0		<0.25	<0.25
Heymes et al. closest example A4***	4.32	0.37	1.29	0.001	0.08	0.15
*Cr: ≤ 0.15 % ** 0 < Mn-2Fe < 0.2 *** Cr 0.005 %, Zn 0.05 %, Ti 0.02 %; Applicants selected Heymes et al. A4 as the closest example because it has the lowest Mn level of the Heymes et al. examples. Heymes et al., col. 6, line 6 and col. 7, line 2, explains its examples were AA2024 alloys.						

The difference between Mn levels of AA2024 (of the table) and AA2024 (of Heymes et al. A4) is about 0.2 %. It is respectfully submitted this makes AA2024 and Heymes et al. A4 comparable such that comparing the present invention with AA2524 is a reasonable substitute for comparing it with Heymes et al. A4.

Thus, the data of Tables 2 and 3 of the present application is relevant to showing unexpected results over Heymes et al. Applicants compare alloys 1 and 2 of the present invention having 0% Mn to AA2024 and AA2524 alloys which have higher levels of Mn. New Claims 52 and 53 recite 0% Mn.

As asserted in response to a prior Office action, when the elemental ranges as recited by present claim 23 are selected and the alloy is processed in the order as recited, unexpected results are realized. Applicants direct the Examiner's attention to paragraphs [0070]-[0071], which state:

> [0070] <u>It has surprisingly been found</u> that lower levels of manganese result in a high toughness and an improved fatigue crack growth resistance specifically in areas where the toughness and fatigue crack growth resistance under tensile load are critical. Surprisingly, the alloy of the instant invention in the T3 temper, more specifically in the T351 temper, has a significant improved toughness by lowering the amount of manganese. Furthermore, it has been found that by increasing the amount of Si it is possible to achieve strength levels comparable with strength levels of conventional AA2x24 alloys. Furthermore, it has been found that by increasing the Si content improved FCGR performance is obtained. The Si content is increased to levels above those used in current aerospace grade materials, viz. typically <0.10, and preferably <0.07 wt.%.
> [0071] More specifically, it has been found that a reduction of the manganese level and by increasing the silicon level the fatigue crack growth resistance of the alloy could be enhanced by up to 90% compared to a conventional 2024 alloy and up to approximately 65% compared to a conventional 2024 alloy if the strength levels are maintained. In that case even the toughness was improved compared to the toughness of conventional 2024 alloys. By lowering the level of manganese toughness as well as fatigue crack growth resistance was increased wherein the strength levels decreased. By also increasing the level of silicon the strength level increased again without lowering the toughness to unacceptable levels.

(emphasis added)

Moreover, Table 3 of the present specification, shows 0% Mn and 0.11-0.25% Si, results in unexpectedly improved FCGR with high strength. As explained in paragraph [0102], Table 3 shows lowering Mn level improves lifetime as measured by FCGR and this improvement is more or less independent of Si-levels. Thus, while the Mn level is lowered, the Si level can be increased to increase strength as shown in Table 2 without harming FCGR. This simultaneous control of these two ingredients is highly beneficial to achieve high strength, long lifetime alloys that are very useful for aeronautical purposes.

B. Heymes et al. in view of Colvin

Claims 24 and 25 stand rejected under 35 USC § 103(a) as allegedly being unpatentable over Heymes et al. in view of Colvin. The Office Action asserts Heymes et al. teaches each feature of the rejected claims, except for annealing or reheating the hot rolled ingot and further hot rolling, for which purpose Colvin is cited.

However, ii is respectfully submitted that Colvin fails to cure the deficiencies of Heymes et al. against base Claim 23, thus dependent claims 24 and 25 are also allowable.

Moreover, Colvin is concerned with series 2xxx alloys, having about 0.3 to 0.9% Mn (as recited by claims 1 and 70 therein). Hence the combination of the teachings of these references would actually lead one of ordinary skill in the art away from a process of manufacturing a product having Mn present only as an incidental element.

II. Conclusion

In view of the above, it is respectfully submitted that all objections and rejections are overcome. Thus, a Notice of Allowance is respectfully requested.

Respectfully submitted,

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